

Method and System for Determining an Optimum Pumping Schedule Corresponding to an Optimum Return on Investment when Fracturing a Formation penetrated by a Wellbore

Abstract

A new method for determining a pumping schedule that will produce an acceptable return on investment for a particular well includes selecting a pumping schedule, which includes an initial pumping schedule and a remaining pumping schedule, adapted for fracturing a formation around one or more perforations in the particular well. Using the initial pumping schedule, interrogate a pump data model to produce a set of fracture characteristics. A set of tiltmeter sensors and micro-seismic sensors placed adjacent the fracture in the formation will also generate a set of fracture characteristics. If the set of fracture characteristics originating from the pump data model do not substantially match the set of fracture characteristics originating from the tiltmeter sensors and the micro-seismic sensors, the pump data model must be

calibrated. When the pump data model is calibrated, use the remaining pumping schedule to interrogate the calibrated pump data model thereby producing a production rate and a return on investment corresponding to the production rate. If the return on investment is not an "optimum" return on investment, change either the proportions of frac fluid and proppant in the remaining pumping schedule or the viscosity of the fluid or the injection rate until a new remaining pumping schedule is determined. When the new remaining pumping schedule interrogates the calibrated pump data model, hopefully an "optimum" production rate and an "optimum" return on investment will be determined for the particular well. The owner of the particular well or other field engineers or other decision-making personnel will then consider the "optimum" return on investment before using the remaining pumping schedule to continue fracturing the formation around the perforations in the wellbore.